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NOTES TO CONTRIBUTORS

1. Papers submitted should tackle livestock and poultry production problems in an original way.

2. Review papers of subjects of general interest may be published at intervals and will be prepared on invitation by the Editorial Board.

3. All papers will be subject to critical review by the Editorial Board, or others appointed by the Editor. Papers needing revision will be returned to authors and should be revised and returned promptly. Papers not suitable for publication will be returned to authors with a statement of reasons for not accepting them.

4. Authors are requested to submit their papers, finished in all details in type-script, double line spacing and with ample margins. Two copies beside the original are needed. The length of articles will be limited to 35 printed pages. Typing should be on quarter papers. Tables should be as few and as simple as is feasible for presentation of essential data.

5. Illustrations, should be referred to as figures when ever possible. They should be drawn on smooth white Bristol Board in India Ink with marginal lettering inserted in pencil. Legends for figures and plates should be type-written separately from the illustrations for the reason that the type is set by the printer and the illustrations are made by the engravers. The order and approximate position of the illustration in the text should be marked.

6. References, all references in the text should site the name of the author, followed by the year of publication. The papers so refered to being collected in a list of «References» at the end of the article. In this list the arrangement of the articles should be alphabetically, by author and cronologically under each author. The authors name should be followed by the year of publication, the title in full, the name and volume of the publication, and the first and last pages of each paper if published in a periodical, and the number of publication, place of publication

CONTENTS

	Pages
Wool Characteristics of Texel Sheep. By M. T. RAGAB AND K. E. GHONEIM	1-21
Wool Characteristics of the Barki Sheep. By M. T. RAGAB AND K. E. GHONEIM	23-35
Factors Affecting Gain in Fattening Egyptian Steers on Clover. By G. A. R. KAMAR, A. L. BADRELDIN AND H. Z. ABDEL HAY	37-51
Suckling in Ossimi and Rahmani Lambs. By M. A. SHARAFELDIN AND A. MOSTAGEER	53-58
Factors Influencing Wool Follicle Characteristics in Fat-Tailed Sheep. By A. L. BADRELDIN, G. R. A. KAMAR, M. M. SHAFEI AND I. F. M. MARAI	61-73

WOOL CHARACTERISTICS OF THE BARKI SHEEP

BY

M. T. RAGAB ⁽¹⁾ AND K. E. GHONEIM ⁽²⁾

SUMMARY

Sixty-six Barki lambs at 6 months old and forty-seven Barki sheep at 12 months of age from the flocks belonging to the Tahreer Province were used to study wool characteristics of this breed of sheep.

Grease fleece weight, clean wool percentage, kemp percentage, fiber diameter, number of crimps per two centimeters, staple length, fiber length and density of wool fibers were the traits studied.

The results showed that the Barki sheep belongs to the long-wool type where the total staple length was 6.2 inches for the first 12 months growth. Coarse wool produced had an average fiber diameter of 35.4 microns and contained about 14 % medullated fibers.

The wool of the Barki sheep had little yolk or wool-grease; it ranged between 75.8 and 87.7 % in clean wool percentage. Barki fleeces are of kempy type, the average kemp percentage was 3.2 and 8.4 at 6 and 12 months of age, respectively. Barki wool contains three types of fibers, *i. e.* outercoat, undercoat and kemp fibers.

The average number of crimps per two centimeters was 2.7 for the Barki wool. The mean fleece weight of the Barki sheep

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was 3.3 pounds for the first 12 months of age. The average number of fibers per square centimeter was 1725 ± 74 and 1967 ± 67 fibers for the shoulder and hip regions respectively. Phenotypic correlations between wool characteristics were calculated.

The Barki takes its name from «Barka» which is the Arabic name of Cyrinyca. It is a common sheep to Egypt, since it is raised by all Nomad Arabs living on the coastal strip of the Western Desert in Egypt. It seems that this breed is the most suitable for the desert areas where food is scarce during most of the year, except for few months when rain is plenty and grasses are at their lush. The sheep is small in size weighing about 80 to 100 pounds when mature. It has a white coarse fleece. The face is either reddish-brown, black of a solid colour or speckled with white spots. The head, belly and legs are bare of wool. It has a narrow and a shallow body, level and narrow back and long legs. Rams are horned while ewes are hornless. The ears are of medium length. The tail is mildly fat with a twisted end which should not come below the hocks.

It is commonly agreed that the wool productivity of this sheep is much better than other breeds of sheep indigenous to Egypt. Therefore, it was thought to analyse the wool characteristics and productivity of this breed, to ascertain their validity under the local conditions.

MATERIAL AND METHODS

This work was carried out at the Tahreer Province Project. Sixty-six Barki lambs, 6 months old, and forty-seven at 12 months of age were shorn at October 1957 and April 1958 respectively. Samples of wool were collected at these two ages at April and October. All animals used in this study were singles, and rams were not castrated. The sex ratio at the two ages was nearly 50 percent.

The traits studied were grease fleece weight, clean wool percentage, kemp percentage, fiber diameter, crimps, staple length, fiber length and density of wool fibers.

Prior to shearing, a small sample of grease wool was clipped from the right shoulder of each animal using fine scissors. This sample was used to determine the shoulder's fiber diameter, number of crimps per two centimeters, staple length, fiber length and kemp percentage by weight.

At shearing time, each fleece was weighed in kilograms, and a small sample of the side wool (weighing approximately 10 to 20 grams) was taken from each sheep before shearing for estimating clean wool percentage. For measuring staple length, the method suggested by Skinkle (1940) was used. For fiber length, fiber diameter and number of crimps per two centimeters, the methods used by Hunt *et al* (1952) were followed.

In estimating the density of fiber population, the method used by Galpin (1948) was applied. The percentage of the weight of kemp was estimated using the method reported by Roberts (1926). For estimating the clean wool percentage the side samples were weighed and scoured applying the method of Hind (1948). After scouring, samples were washed in hot water and finally with cold water, then they were dried in an electric oven at 212°F. for six hours. Samples were then conditioned in a room at a relative humidity of about 65 percent for three days, after which they were weighed in the same room and clean wool percentage was computed.

Methods given by Snedecor (1950) were used for calculating the means, standard errors and correlation coefficients at different ages, as well as for testing the significance of differences between groups.

RESULTS AND DISCUSSION

1. Grease fleece weight.

The amount of wool given by Barki sheep is very low compared to the wool produced by improved foreign breeds of sheep. The average grease fleece weight was 0.733 ± 0.035 and 0.781 ± 0.027 kgs. for Barki sheep at 6 and 12 months of age respectively (Table 1).

TABLE 1

Mean grease fleece weight, clean wool percentage, kemp percentage, fiber diameters, crimps, staple lengths and fiber lengths for Barki sheep at different ages.

Character	At 6 months of age	At 12 months of age
Grease fleece weight (Kgs.).....	0.733±0.035	0.781±0.027
Clean wool percentage.....	87.65±0.46	75.84±1.76
Kemp percentage.....	3.15±0.15	8.39±0.84
Fiber diameter (microns).....	33.34±0.41	37.53±0.45
No. of crimps per 2 cms.....	2.56±0.08	2.81±0.09
Staple length (mm.).....	74.82±2.39	80.43±2.62
Fiber length (mm.).....	103.80±3.32	112.53±2.61

The average total output of wool was 3.3 pounds representing twelve months growth of native sheep. Kammlade (1947) stated that 11, 12, 14 and 13 pounds of grease fleece weight are the average clip weight for Oxford, Columbia, Lincoln and Merino in a period of 12 months. Sidky (1948) and Ragab *et al* (1956) reported that the average fleece weights for Ossimi and Rahmani sheep ranged between 2.5 and 4.5 pounds annually which is low as that of the Barki sheep.

Although rams produced heavier fleeces than ewes in Barki sheep at the two ages studied, yet no significant difference was found between the two sexes (Table 1). However, these results are in agreement with those stated by Hazel and Terrill (1946), Terrill *et al* (1947, 1948) and Kyle and Terrill (1953) who found that fleece weight of yearling rams was heavier than that of yearling ewes in the Columbia, Targhee and Rambouillet sheep. This was also true for the Australian Merino sheep (Morley, 1951) and Texel sheep (Karam and Ragab, 1959). The difference in fleece weight between the two sexes can be partly accounted for by difference in level of management between rams and ewes. The former group is usually given better food and care than the latter.

2. Clean wool percentage.

Clean wool percentage ranged between 75.8 % and 87.7 % (Table 1). Such shrinkage in wool is very low compared to foreign breeds of sheep. Grandstaff (1941), Kammlade (1947) and Wilson (1951) showed that wool may vary in shrinkage from 30 % to 80 % in different breeds of sheep. The low shrinkage of Barki wool is due to the fact that it holds little yolk or wool grease which is important in preserving the fibers from the detrimental effects of weather. Ragab *et al* (1956) studying this problem in Ossimi and Rahmani sheep, found that wool in these breeds shrank between 10 and 20 % which is very near to that of the Barki sheep.

Sex had no significant effect upon clean wool percentage at the two ages studied. This is in accordance with the results reported by Ragab *et al* (1956) on Ossimi and Rahmani sheep.

Wilson (1938) and Pohle and Keller (1944) showed that the clean weight of a fleece is far more significant than the grease weight in the selection of breeding animals for high wool production, especially rams whose offspring are to be retained for breeding. Besides being important biologically, shrinkage is intimately associated with all commercial aspects of wool production.

3. Staple length.

The total staple length of the Barki was 6.2 inches for the first 12 months growth (Table 1). Kammlade (1947) stated that the staple length was 3, 4 and 7 inches for Merino, Oxford and Romney sheep respectively. Thus, the Barki breed can be classified as a long-wool type of sheep. Badreldin *et al* (1952) and Ragab *et al* (1956) concluded that the Ossimi and Rahmani sheep are of long-wool type, having staple length ranging between 5.5 and 6.5 inches for the first twelve months growth.

The daily gain in staple length for the Barki sheep was approximately 0.4 mm. during the first year of age. Ragab *et al* (1956) showed that the Ossimi and Rahmani sheep ranged between 0.4 and 0.5 mm. in this respect. Sex had no significant effect upon staple length of Barki sheep at the two ages studied.

Hazel and Terrill (1945, 1946) and Terrill *et al* (1948), working with Range Rambouillet, Corriedale, Columbia and Targhee lambs, and Sidwell *et al* (1951), studying Navajo and Navajo crossbred lambs, found that the ewe-lambs at weaning age had longer staples than ram-lambs, while at yearling age rams had longer staples than ewes (Terrill *et al*, 1947 and 1948).

4. Fiber length.

The total fiber length for the first twelve months growth was 216.3 mm. for the Barki sheep (Table 1). Ragab *et al* (1956) reported that the average fiber length was 209.2 and 160.7 mm. for the Ossimi and Rahmani sheep respectively in a period of 12 months. This indicates that the Barki sheep produce the longest fibers among the Egyptian breeds of sheep studied.

Sex had no significant effect on the incidence of fiber length of Barki sheep. This is in accordance with the results reported by Ragab *et al* (1956) on Ossimi and Rahmani sheep.

In the case of coarse wool, the longer the staple the more favourable it is for industrial purposes as it is mainly used in carpet manufacture. In this case, the spinning of wool thread should depend on long staples in order not to give a chance, when making the tuft of the carpet, to wear when cleaning, as it will be made of a solid part of the fiber. This is absolutely contrary to the prerequisites of the industrial circles in the case of fine wool. In this case, spinning the crimped wool fibers mainly depends on the dentation rather than the length of the staple itself.

5. Fiber diameter.

The average fiber diameter for the first year of age was 35.4 microns for Barki sheep (Table 1). Jones *et al* (1944) found that the fiber diameter of Rambouillet was 11.8 microns, while Pohle (1942) stated that the average fiber diameter was 21.2 and 24.7 microns at yearling age for Corriedale and Columbia sheep respectively. The results obtained on Barki sheep compared to those reported by other workers, show that the fleece of the Barki breed is of coarse wool. Badreldin *et al* (1952)

and Ragab *et al* (1956) came to the same conclusion when studying the fleeces of Ossimi and Rahmani sheep.

Sex proved to have no significant effect upon fiber diameter of Barki sheep. The same observation was reported by Ragab *et al* (1956) on Ossimi and Rahmani sheep.

It was found that there was about 14 % medullated fibers in Barki fleeces. Moreover, different types of medullae were observed in Barki wool fibers, i. e. (A) fragmentary, (B) interrupted, (C) scattered, (D) continuous (Plate II). Kemp fibers were nearly all medullated and have a scattered or continuous medullae (Plate III). This high percentage of medullated fibers in Barki fleeces influences its wool value, since medullated fibers do not accept dye in manufacture and behave almost like kemp. Grandstaff (1941) and Blunn (1943) studying the Navajo sheep, observed that the long coarse outercoat is made up of medullated or non-medullated fibers. They found that there was about 9 % medullated fibers in Navajo fleeces.

6. *Crimps.*

The average number of crimps per two centimeters was 2.56 and 2.81 at 6 and 12 months of age respectively (Table 1). Therefore, it is concluded that the wool of the Barki sheep has few crimps in their fibers compared to the improved breeds of sheep. Sex had no significant effect on the incidence of crimps.

Nordby (1951) stated that crimp is an important character because it is associated with good elasticity in the fiber, a factor of importance in woollen manufacture. He showed that the presence of crimp indicates that the fiber is well preserved with yolk, and this has a definite value to the grower and processor. He also reported that dry and harsh wool is generally void of crimps, and is therefore less attractive to the buyer.

7. *Kemp.*

The average kemp percentage at the shoulder region was 3.15 % and 8.39 % for Barki sheep at 6 and 12 months of age, respectively (Table 1). Duerden (1926) and Roberts (1926) stated that 2-3 % of kemp at the shoulder is a certain indication of a kempy fleece. There-

fore, the fleeces of Barki sheep are of kempy type. Ragab *et al* (1956) found that the average kemp percentage was 2.4 and 9.9 for the Ossimi and Rahmani sheep at the first year of age, respectively.

The coefficient of variability for kemp percentage ranged between 37.8 and 68.3 % in the Barki sheep. Bryant (1936) stated that kemp depends in its inheritance on multiple factors. He also concluded that kemp could be reduced by the use of homozygous non-kempy breeding rams, accompanied by culling kempy progeny.

It was found that the wool of Barki sheep contains three types of fibers, *i. e.* outercoat, undercoat and kemp fibers (Plate IV). The kemp fibers in Barki fleeces reach, in some cases, the length of the undercoat fibers. These different types of fibers in Barki wool influence and limit its value in manufacture. The short undercoat fibers may be lost in the combing process. The outercoat fibers in the Barki fleeces are long, coarse, hair-like fibers, while the undercoat is made up of short and fine wool fibers.

The presence of difference types of fibers in Barki wool may be due to the fact that Barki sheep are not well improved for fine wool production. However, Blunn (1940, 1943), Grandstaff (1941) and Grandstaff and Blunn (1945) stated that Navajo fleeces are made up of distinct outercoat, undercoat, kemp and other medullated fibers.

8. Density of wool fibers.

The average number of fibers for the whole experiment was 1846 ± 59 fibers per square centimeter. This is considered very low when compared with the density of the European breeds of sheep reported by Wolf *et al* (1943) in Rambouillet yearling ewes and Hardy and Wolf (1947) in Shropshire sheep.

The average number of fibers per square centimeter for the four seasons was 1725 ± 74 and 1967 ± 67 fibers for the shoulder and hip regions, respectively. The difference between the number of fibers for the two regions was statistically highly significant. Also, there were highly significant differences between seasons and individuals in this respect. Badreldin *et al* (1952) found that the average number of fibers per square centimeter was 1343 ± 29 and 1425 ± 29 fibers for the shoulder and hip regions, respectively, in Ossimi sheep. It seems that the Barki

sheep have a denser fleece than either Rahmani or Ossimi. This may be responsible for the greater wool production of this breed compared to the other indigenous breeds of sheep.

Correlations Between Wool Characteristics

The coefficients of correlation between the various characters studied were computed for Barki sheep at 6 and 12 months of age (Tables 2 and 3).

The presence of positive correlation between grease fleece weight and staple length, and between grease fleece weight and fiber length is supported by the results reported in other studies (Spencer [1925], Spencer *et al* [1928], Lambert *et al* [1938], Pohle and Keller [1943], Berge *et al* [1944], Jones *et al* [1944], Slen [1949], Morley [1951] and Hunt *et al* [1952]). Also, there was a positive correlation between fiber diameter and lack of staple length, as well as between fiber diameter and fiber length.

There was a negative correlation between staple length and number of crimps. This implies that as wool increases in length, number of crimps tends to decrease. This is not in agreement with Davenport and Ritzman (1926) and Swart and Kotzé (1937) who found that there was a positive correlation between the number of crimps and the length of the fibers. Nevertheless, our results are in accordance with those reported by Morley (1951) for Australian Merino sheep.

It is interesting to note from Tables 2 and 3 that there was no correlation between kemp and the other wool characters. Therefore, it is concluded that kemp percentage is not correlated with any other wool characters. Hence, the elimination of kemp would not injure any economical wool quality.

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الملخص

شملت هذه الدراسة ٦٦ حملاً من الأغنام البرقية في عمر ستة شهور و ٤٧ نعجة في عمر ١٢ شهراً في مديرية التحرير .

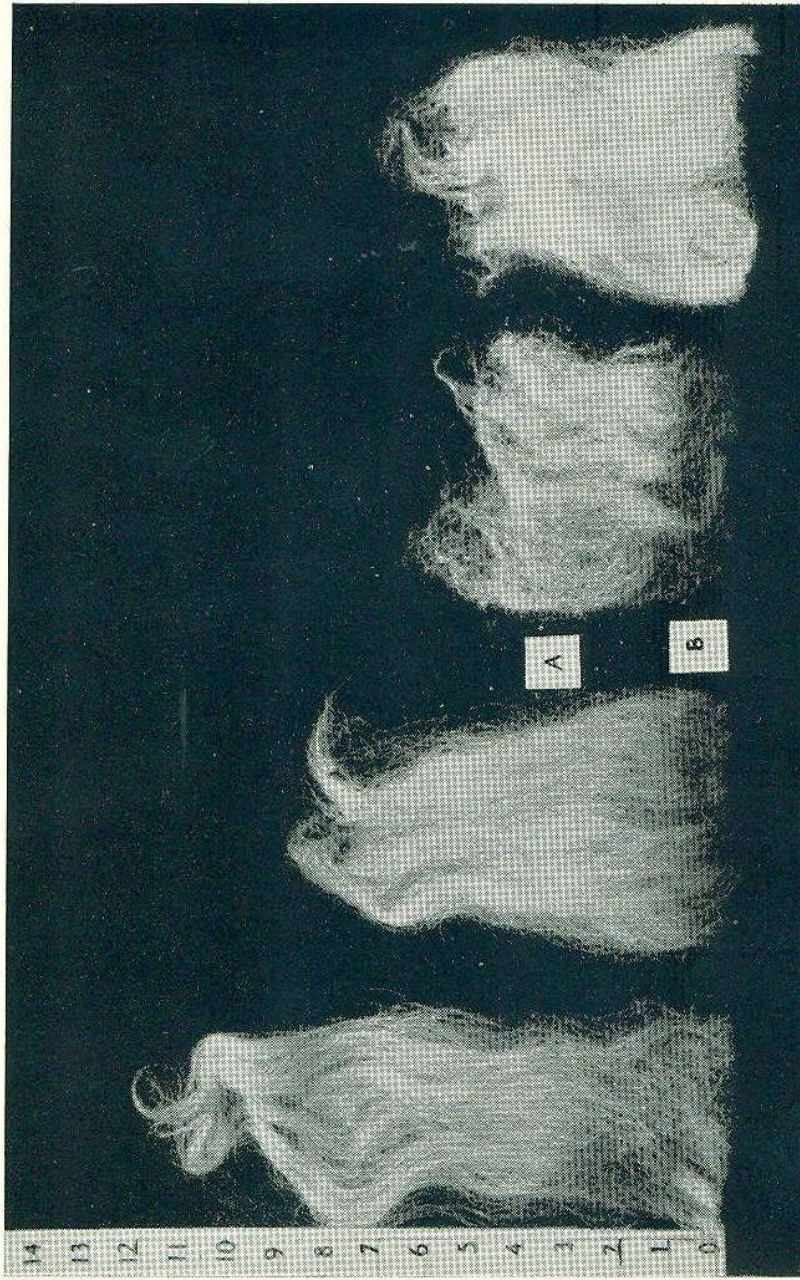
وقد تبين من نتائج هذا البحث أن أغنام البرقي تنتمي إلى مجموعة الأغنام طويلة الصوف حيث بلغ طول صوفها في فترة الإثني عشر شهراً الأولى من عمرها ٦,٢ بوصة (١٥,٥ سم) وهذا الصوف من النوع الخشن الذي يبلغ متوسط سمك الفتلة ٣٥,٤ ميكرون يحتوي ١٤٪ منها على ألياف ذات تخانة داخلية ، وقد تبين أيضاً أن صوف الأغنام البرقي يحتوي على القليل من المادة الدهنية ومع الصوف فقد تراوحت نسبة الصوف المغسول بين ٧٥,٨ ، ٨٧,٧٪

وصوف الأغنام البرقي من الأصواف ذات الشعر الصلب ، إذ بلغت نسبة هذا الشعر ٣,٢٪ في عمر ٦ شهور ، ٨,٤٪ في عمر ١٢ شهراً .

هذا بالإضافة إلى أن الدراسة قد بينت أن صوف الأغنام البرقي يحتوي على ثلاثة أنواع من الألياف وهي الألياف الخارجية وألياف تحتية وشعر صلب .

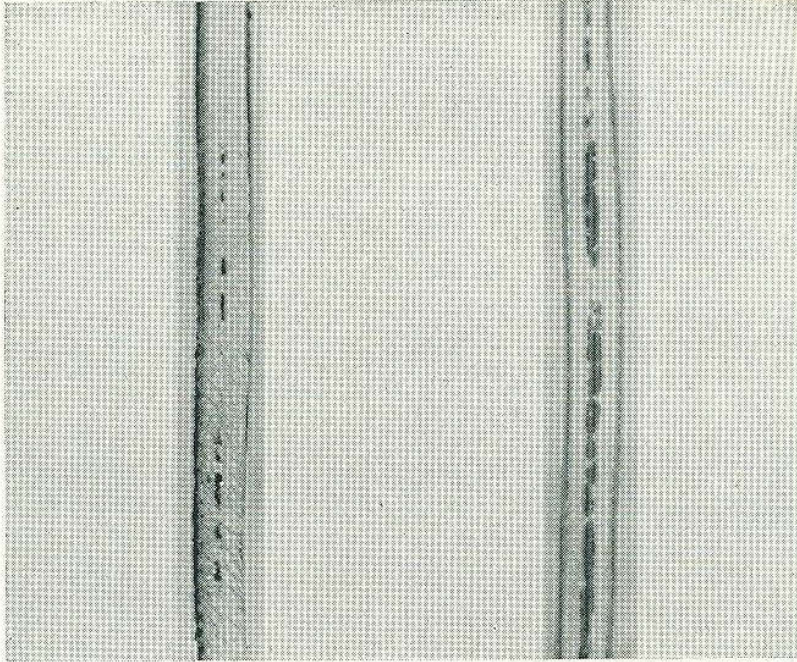
وقد اتضح أيضاً أن متوسط عدد التموجات في كل ٢ سم كان ٢,٧ كما بلغ متوسط وزن الجزء ٣,٣ رطلاً في عمر ١٢ شهراً ، هذا وقد بلغ عدد الألياف في السنتيمتر المربع 1725 ± 74 في منطقة الكتف و 1967 ± 67 في منطقة العجز في عمر ٦ شهور .

وعند دراسة العلاقات المتبادلة بين صفات الصوف المختلفة اتضح وجود معاملات ارتباط معنوية بين وزن الجزء وطول فتلة الصوف وقطر فتلة الصوف وطولها وطول فتلة الصوف وتختاتها في عمر ٦ شهور بالإضافة إلى وجود مثل هذه العلاقات المعنوية بين التموج وطول فتلة الصوف في عمر ١٢ شهراً .



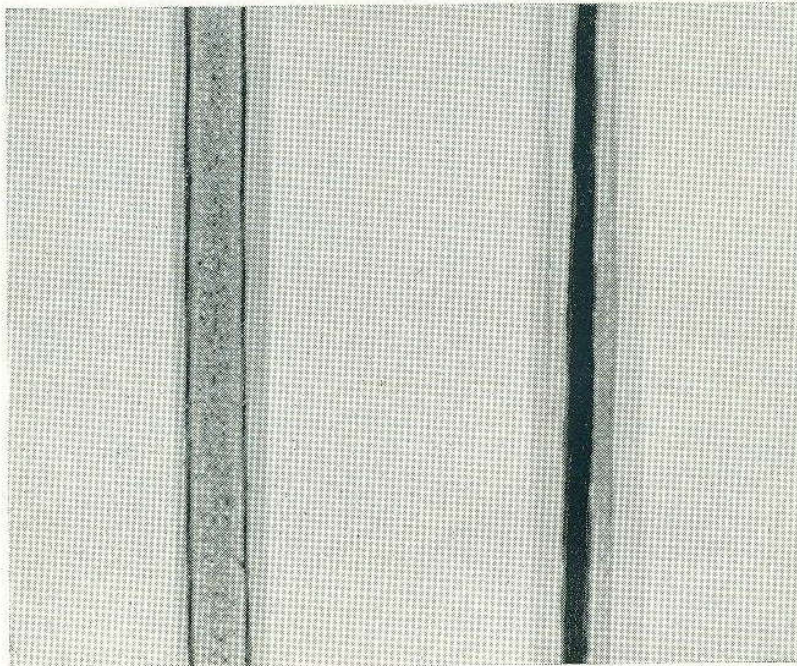
Wool samples from Egyptian Barki sheep, 12 months old, six months growth; showing the difference in length, open type and containing little amount of grease:

A.—The portion of sample nearly free from grease. B.—The portion of sample containing little grease.



A

B

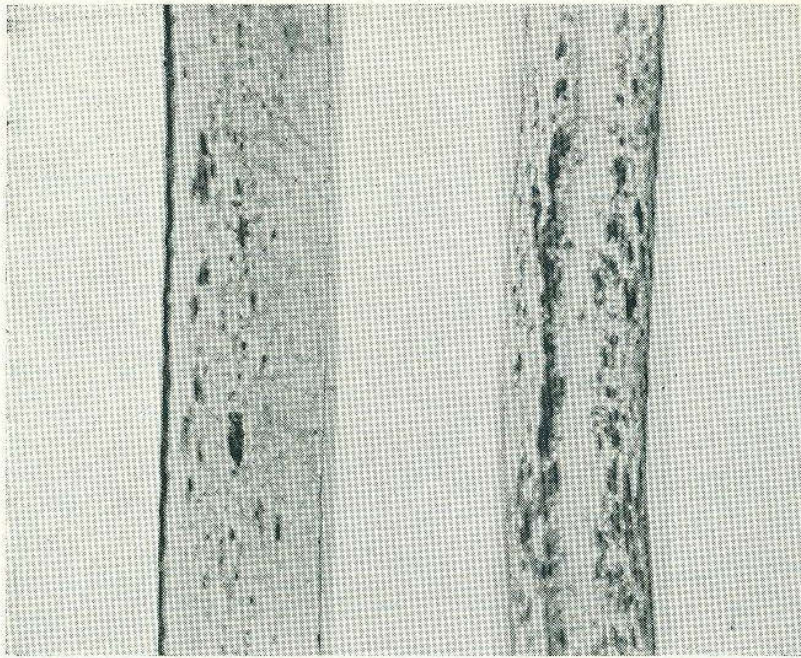


C

D

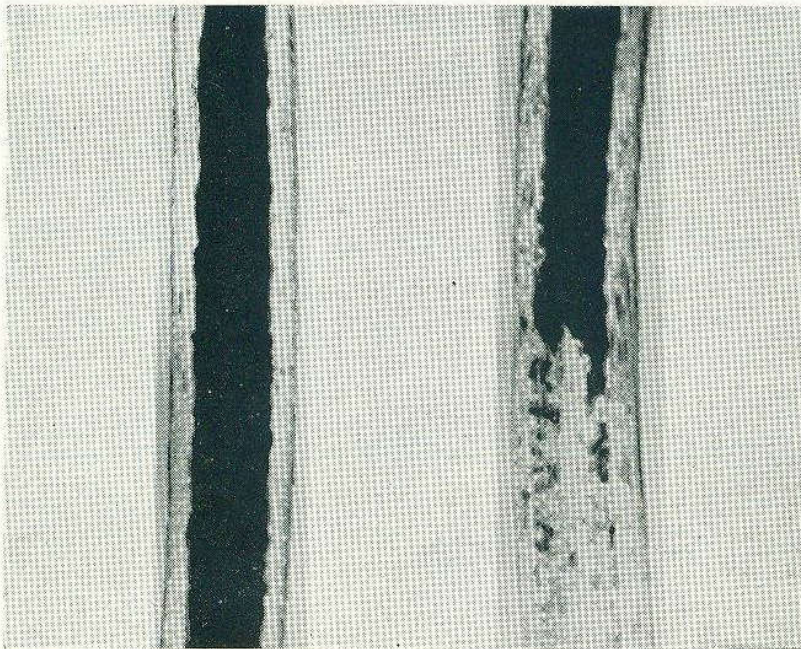
Portions of outercoat fibers from Barki fleeces; X 166, showing different types of medullae :

- | | |
|--------------------------|-------------------------|
| A.—Fragmentary medullae. | C.—Scattered medullae. |
| B.—Interrupted medullae. | D.—Continuous medullae. |



A

B



C

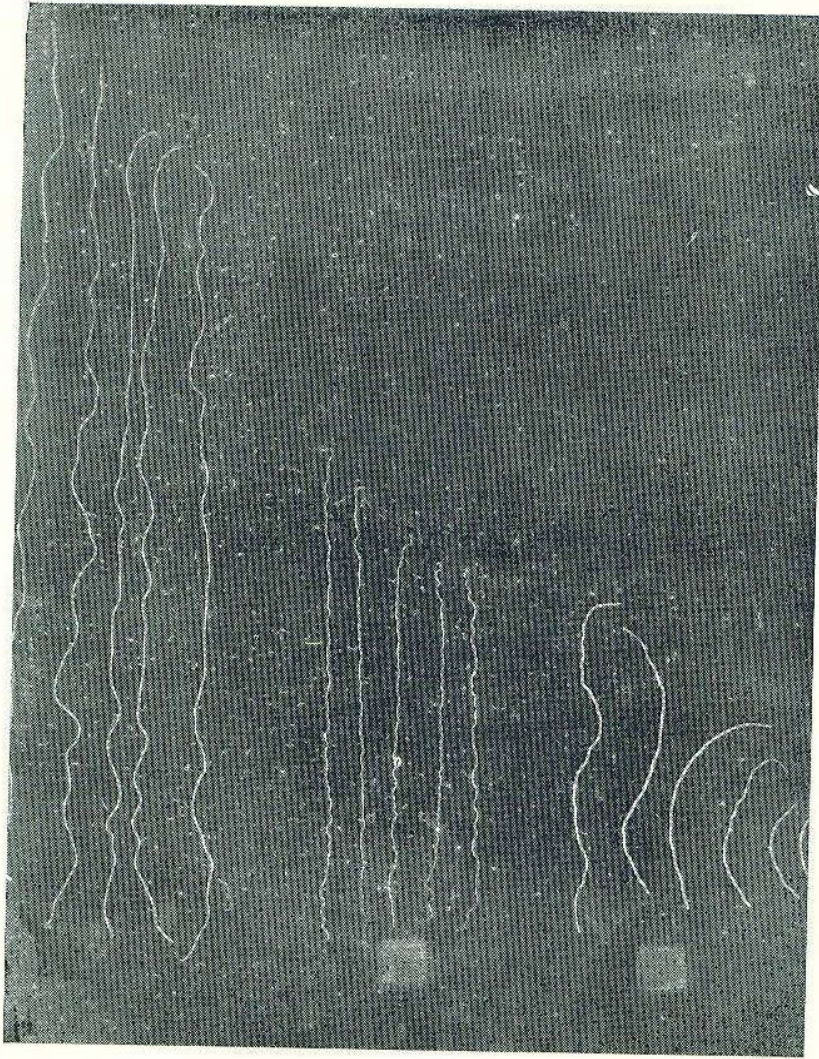
D

Portions of kemp fibers from Barki fleeces, X 166, showing different types of medullae :

A and B.—Scattered medullae.

C.—Continuous medullae.

D.—Continuous and scattered medullae in the same fiber.



A

B

C

Three types of fibers obtained from Barki fleeces at one year
of age (six months growth) :
A.—Outercoat fibers. B.—Undercoat fibers. C.—Kemp fibers.